Accessory Slip of the Extensor Carpi Ulnaris: A Cadaveric Assessment

Richard M. Hinds, MD[1] Michael B. Gottschalk, MD[2] Eitan Melamed, MD[1] John T. Capo, MD[1] S. Steven Yang, MD, MPH[1]

[1] Division of Hand Surgery, New York University Hospital for Joint Diseases, New York, New York
[2] Department of Hand and Upper Extremity Surgery, Emory University School of Medicine, Atlanta, Georgia

Address for correspondence Richard M. Hinds, MD, Division of Hand Surgery, New York University Hospital for Joint Diseases, 301 East 17th Street, New York, NY 10003 (e-mail: RichardHindsResearch@gmail.com).

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Abstract

Background An accessory slip arising from the extensor carpi ulnaris (ECU) tendon that inserts on the fifth metacarpal bone has been identified. We describe the frequency of this accessory slip arising from the ECU tendon and provide both qualitative and quantitative description of the slip via cadaveric examination.

Methods Fifty (28 males and 22 females) cadaveric upper extremity specimens were examined after loupe-aided dissection of the dorsoulnar wrist and hand with identification of the ECU tendon. The presence of an accessory slip arising from the ECU tendon was noted. The insertion and morphology of the accessory slip was also described.

Results An accessory slip arising from the ECU tendon at the level of the radiocarpal joint was found to insert on the fifth metacarpal bone in 11 (22%) specimens. Nine accessory slips inserted at the base of the fifth metacarpal (Nakashima Type A) and two inserted at the fifth metacarpal head (Nakashima Type C). Mean width of the accessory slip was 1.2 ± 0.4 mm. No evidence of sexual dimorphism was found regarding the morphology of the accessory slip.

Conclusion The current study demonstrates the relative frequency and morphology of the accessory slip arising from the ECU tendon. This variant should be of diagnostic consideration in ailments of the dorsoulnar wrist and hand. Hand surgeons should be aware of this anatomic variant and its potential for clinical manifestation.

Keywords
- accessory slip
- anatomy
- extensor carpi ulnaris
- tendon
- wrist

Several anatomical anomalies of extensor structures of the hand and wrist have been reported. Commonly identified variants include the extensor indicis medii communis and the extensor digitorum brevis manus with an incidence of 16 and 9%, respectively.[1] Less common variations include the conexus intertendinei and multiple insertions of the extensor digitorum communis.[2,3] However, few studies have examined the anatomical variation of the extensor carpi ulnaris (ECU) tendon.

An accessory slip arising from the ECU tendon that inserts on the fifth metacarpal bone has previously been reported in the anatomy literature.[4] The slip arises from within the sixth dorsal compartment at the level of radiocarpal joint and extends the fifth carpometacarpal joint when tensioned. The purpose of this investigation was to assess the frequency of the accessory slip arising from the ECU tendon and to provide a qualitative and quantitative description of the slip via cadaveric examination. Additionally, we sought to determine if sexual dimorphism is associated with the frequency and morphology of the accessory slip.

Materials and Methods

Fifty cadaveric upper extremity specimens (25 matched pairs) were examined in this investigation. A total of 11

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matched pairs were donated from female cadavers and 14 matched pairs were donated from male cadavers. Average age of the donors at their time of death was 83 years (range, 48–100). All specimens were free of trauma or deformity. Specimens underwent careful, loupe-aided dissection of the dorsoulnar wrist and hand with identification of the ECU tendon. Specimens were then assessed for the presence of an accessory slip arising from the ECU tendon, noting the insertion and width of accessory slip. Anatomic measurements were obtained using digital calipers.

The slips were further characterized as Type A, B, or C as per the Nakashima classification.[4] An accessory slip was designated as Type A if the slip inserted on the base of the fifth metacarpal adjacent to the primary tendon insertion, Type B if the slip inserted on the midshaft of the fifth metacarpal, or Type C if the slip inserted on the fifth metacarpal head (►**Fig. 1**). Comparisons between male and female specimens were performed using Fisher exact tests and Student *t*-tests to analyze categorical and continuous data, respectively. The level of significance for all tests was set at $p < 0.05$.

Results

An accessory slip arising from the dorsoradial portion of the ECU tendon at the level of the radiocarpal joint and inserting on the fifth metacarpal bone was found in 22% (11/50) of the specimen. Of the 11 specimen demonstrating the accessory slip, 10 were in associated matched pairs with the unpaired slip found in a left upper extremity. Eighty-two percent (9/11) of the slips were classified as Nakashima Type A (►**Fig. 2**), with 18% (2/11) classified as Nakashima Type C (►**Fig. 3**). No Nakashima Type B slips were noted. Mean width of the accessory slip was 1.2 ± 0.4 mm.

Twenty-five percent (7/28) of the male specimens demonstrated accessory slips, including five Nakashima Type A and two Nakashima Type C slips. Eighteen percent (4/22) of the female specimens had accessory slips, all of which were Nakashima Type A slips. Statistical comparison of accessory slip frequency revealed no significant differences between male and female specimens. Mean accessory slip width was 1.3 ± 0.5 mm in male specimens and 1.1 ± 0.3 mm in female

Fig. 2 Photograph of an accessory slip arising from the ECU and inserting on the base of the fifth metacarpal (Nakashima Type A).

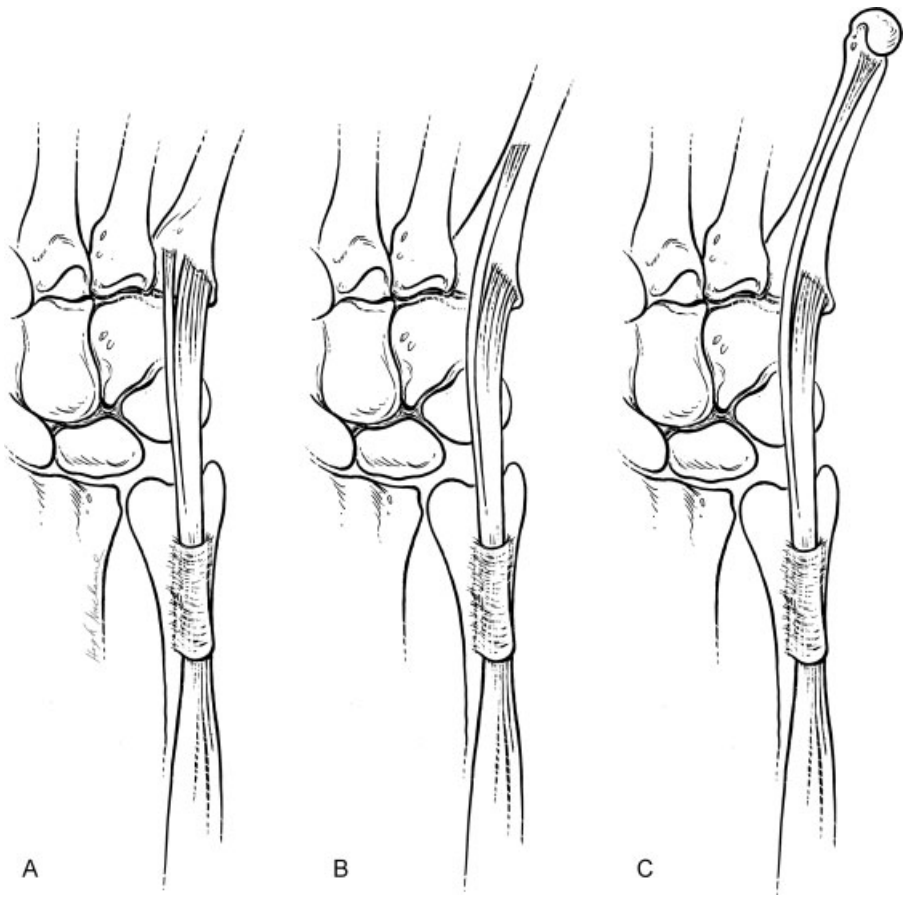

Fig. 1 Illustration of (**A**) Nakashima Type A accessory slip, (**B**) Nakashima Type B accessory slip, and (**C**) Nakashima Type C accessory slip.

Fig. 3 Photograph of an accessory slip arising from the ECU and inserting on the fifth metacarpal head (Nakashima Type C).

specimens. No statistically significant difference in mean slip width was found between the two groups. ►**Table 1** summarizes the comparison of the frequency and mean width of the accessory slip in male and female specimens.

Discussion

Numerous anatomic variants of extensor tendons of the hand and wrist are known to exist. In the Japanese language literature, an accessory slip arising from the ECU tendon and inserting on the extensor apparatus of the fifth digit has been previously described with a reported frequency of 11 to 34%.[5–7] Mestdagh et al as well as Barfred and Adamsen also report this variation in the English language literature.[8,9] In contrast to the previous studies, Nakashima reported the accessory slip to insert on various points along the fifth metacarpal bone rather than on the extensor apparatus of the fifth digit.[4] A more recent study by Pınar et al also supports Nakashima's findings.[10] However, the results of the latter two studies were limited by the examination of cadavers from homogeneous Japanese and Anatolian populations.

In the current study, an accessory slip arising from the ECU tendon and inserting on the fifth metacarpal bone was found in 22% of specimens. No specimens demonstrated an accessory slip inserting on the extensor apparatus of the fifth digit. The accessory slip was largely seen in matched extremities. Only a single unpaired slip was seen in a left upper extremity from a male cadaver. Out of the 11 specimens with an accessory slip, 55% were in the left upper extremity. Similar findings were presented by Nakashima who found an overall accessory slip incidence of 34%.[4] Additionally, 45% of the accessory slips identified were present in left upper extremity specimens, though accessory slips found in matched extremities were not specifically reported in that study.

Nakashima first classified the accessory slip based on the location of its insertion on the fifth metacarpal bone.[4] He found that Type A slips (base of fifth metacarpal) comprised 86%, Type B (midshaft of the fifth metacarpal) 9%, and Type C (fifth metacarpal head) 5% of the accessory slips. In our study, Type A slips predominated, accounting for 82% of the accessory slips, with Type C slips comprising the remaining 18%. There were no specimens demonstrating a Type B accessory slip in our study. Possible reasons for the discrepancy between our findings and those of Nakashima include the number of specimens examined and the origin of the cadavers from which the specimens were donated. Nakashima assessed 240 upper extremity specimens from Japanese cadavers. Our examination of 50 upper extremity specimens is comparatively smaller and may have yielded different findings secondary to the presumed ethnic heterogeneity of American cadavers compared with the homogeneity of Japanese cadavers.

In our study, mean width of the accessory slip was 1.2 mm. This value was comparable to results in similar studies. Nakashima noted a mean accessory slip width of 1.53 mm in his cadaveric assessment.[4] In the study by Pınar et al, the reported mean width of the accessory slip was 1.4 mm.[10]

Our comparison of the frequency and width of the accessory slip in male and female specimens yielded interesting findings. The accessory slip was found to be slightly more common among male specimens. Similarly, male specimens demonstrated accessory slips of somewhat greater width than female specimens. However, neither of these findings was statistically significant, indicating that there is no sexual dimorphism regarding the accessory slip arising from the ECU tendon.

The accessory slip was first clinically described in 1986 in a case series of three patients.[9] All three patients were women, two of which presented with dorsoulnar wrist pain, swelling, and tenderness recalcitrant to conservative therapy. Wrist exploration in both cases revealed an accessory slip arising from the ECU tendon with improved symptomatology after resection of the accessory slip. In the third patient, the accessory slip was found incidentally during synovectomy of the extensor tendons and ulnar head resection in a rheumatoid patient. The accessory slip was not thought to be contributory to the patient's symptoms and was not resected.

Table 1 Comparison of frequency and mean width of the accessory slip of the ECU tendon in male and female specimens

	Male ($n = 28$)	Female ($n = 22$)	Total ($n = 50$)	*p*-Value
All accessory slips, *n* (%)	7 (25)	4 (18)	11 (22)	0.734
Nakashima Type A, *n* (%)	5 (20)	4 (18)	9 (18)	>0.999
Nakashima Type B, *n* (%)	0 (0)	0 (0)	0 (0)	>0.999
Nakashima Type C, *n* (%)	2 (7)	0 (0)	2 (4)	0.497
Accessory slip width, mm ± SD	1.3 ± 0.5	1.1 ± 0.3	1.2 ± 0.4	0.484

Abbreviations: mm, millimeters; *n*, number; SD, standard deviation.

There are limitations to the current investigation. Quantitative findings regarding the accessory slip were not standardized to the size of the specimens. The ethnicity of the cadavers from which the specimens were donated was also not known. This precluded an evaluation of the frequency of the accessory slips among cadavers of different ethnic origin. Additionally, the findings of our study should be interpreted within context as cadaveric tissue quality differs from that of structures seen intraoperatively.

The current investigation also demonstrates several strengths. Our study includes an evaluation of sexual dimorphism associated with the accessory slip arising from the ECU tendon. Additionally, we present an assessment of the frequency and width of the accessory slip in cadavers of American (ethnically heterogeneous) origin. Furthermore, while prior studies regarding the accessory slip have been published in the anatomy literature, our study is intended for practicing clinicians who should consider this anatomic variant in the assessment of ulnar-sided wrist pain.

While it may be difficult to draw definitive clinical conclusions regarding the accessory slip from our findings and those other studies, we present our investigation in efforts to improve awareness of this relatively frequent anatomic variant arising from the ECU tendon. Further studies are needed to comprehensively describe associated symptomatology and clinical treatment experience.

Note

Investigation was performed at the Division of Hand Surgery, New York University Hospital for Joint Diseases, New York, NY.

All procedures followed as part of this study were in accordance with ethical standards of the Institutional Review Board and with the Helsinki Declaration of 1975, revised in 2000. Informed consent was not obtained as this was a cadaveric study. Figs. 2 and 3 include images of cadaveric specimens; however, no identifiable features are present and confidentiality is maintained. No external funding was obtained in support of this investigation.

Conflict of Interest

None.

Acknowledgments

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